IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

INTELLECTUAL VENTURES I LLC, Plaintiff, v. T-MOBILE USA, INC., T-MOBILE US, INC., ERICSSON INC., and TELEFONAKTIEBOLAGET LM ERICSSON Defendants.	Civil Case No.: 2:17-cv-577 **JURY TRIAL DEMANDED**

COMPLAINT

Plaintiff Intellectual Ventures I LLC for its Complaint against defendants T-Mobile USA, Inc., and T-Mobile US, Inc., Ericsson Inc., and Telefonaktiebolaget LM Ericsson hereby alleges as follows:

THE PARTIES

1. Intellectual Ventures I LLC ("IV") is a Delaware limited liability company with its principal place of business at 3150 139th Ave SE, Bellevue, Washington.

2. T-Mobile USA, Inc. ("T-Mobile USA") is a Delaware corporation with its principal place of business at 12920 SE 38th Street, Bellevue, Washington 98006.

3. T-Mobile US, Inc. ("T-Mobile US") is a Delaware corporation with its principal place of business at 12920 SE 38th Street, Bellevue, Washington 98006. T-Mobile US is the parent corporation of T-Mobile USA and was formerly known as MetroPCS Communications, Inc. ("MetroPCS"). Following an April 2013 business combination between T-Mobile USA and

MetroPCS, MetroPCS was renamed T-Mobile US, Inc. T-Mobile USA and T-Mobile US will be referred to collectively as "the T-Mobile Defendants." The T-Mobile Defendants operate one or more wireless telecommunications networks to provide wireless telecommunications services under brand names including but not limited to "T-Mobile" and "MetroPCS."

4. Ericsson Inc. ("Ericsson") is a Delaware corporation with its principal place of business at 6300 Legacy Drive, Plano, Texas 75024.

5. Telefonaktiebolaget LM Ericsson ("LM Ericsson"), the parent corporation of Ericsson, is a company organized under the laws of Sweden with its principal place of business at Torshamsgatan 23, Kista, 164 83 Stockholm, Sweden. Ericsson and LM Ericsson will be referred to collectively as "the Ericsson Defendants."

NATURE OF ACTION

6. This is a civil action for infringement of U.S. Patent Nos. 6,628,629, 7,359,971, 7,412,517, and RE46,206 ("Patents-in-Suit") arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq.*

JURISDICTION AND VENUE

7. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a) because it arises under the patent laws of the United States.

8. This Court has personal jurisdiction over the T-Mobile Defendants, both of which have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. In particular, they have performed infringing methods, and made and used infringing systems for providing wireless telecommunications services. The T-Mobile Defendants derive substantial revenue from the sale and use of infringing services in this district.

9. The T-Mobile Defendants maintain a significant physical presence in this judicial district. T-Mobile US maintains a corporate office at 2250 Lakeside Boulevard, Richardson, Texas, and T-Mobile USA maintains a Network Operations Center at 7668 Warren Parkway, Frisco, Texas, both of which are located within this judicial district. There are numerous T-Mobile and MetroPCS retail stores within this judicial district, including in each of Allen, Kilgore, Longview, Plano, Sulphur Springs, and Tyler, Texas. The purpose of these stores is to sell user devices, including cell phones, and telecommunications services to be provided by the T-Mobile Defendants.

10. This Court has personal jurisdiction over the Ericsson Defendants, both of which, upon information and belief, have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. The Ericsson Defendants derive substantial revenue from the sale of infringing services and products distributed within this district and expect or should reasonably expect their actions to have consequences within this district.

11. The Ericsson Defendants maintain a significant physical presence in this judicial district. Ericsson's headquarters is located at 6300 Legacy Drive, Plano, Texas 75024, which is within this judicial district. Ericsson is wholly-owned and controlled by LM Ericsson and acts as the agent for LM Ericsson in making sales, servicing equipment, and otherwise carrying out the operations of LM Ericsson in North America. LM Ericsson and its affiliates manufacture wireless telecommunications equipment and then arrange with Ericsson to import those products into the United States for installation in the T-Mobile Defendants' network, including the portion of the network located in this judicial district. Upon information and belief, representatives of LM Ericsson regularly visit this district in their supervisory capacity over Ericsson. At all times relevant hereto, Ericsson was acting as the agent of LM Ericsson.

12. Joinder of the T-Mobile and Ericsson Defendants in this action is proper under 35 U.S.C. § 299(a). IV's right to relief against the T-Mobile and Ericsson Defendants for their infringement of the Patents-in-Suit arises out of the same series of transactions or occurrences, namely their cooperation in planning, developing, testing, operating, and maintaining the T-Mobile Defendants' Long Term Evolution ("LTE") network. No claim is made in this complaint against Ericsson in relation to products or services sold to other wireless carriers.

13. Venue is proper in this judicial district. All of the relevant defendants reside in this judicial district within the meaning of 28 U.S.C. § 1400(b). The T-Mobile Defendants and Ericsson have committed acts of infringement within this district and have regular and established places of business here. These entities employ numerous employees in the district, sell and deliver infringing services to customers in this district, and maintain base stations, switching equipment, and other components of the T-Mobile Defendants' infringing telecommunications network located in the district. LM Ericsson is a foreign corporation, and pursuant to 28 U.S.C. § 1391(c)(3), may be sued in any judicial district. The residency of LM Ericsson is disregarded under § 1391(c)(3) when determining where the action may be brought.

THE PATENTS-IN-SUIT

14. On September 30, 2003, the United States Patent and Trademark Office ("PTO") issued United States Patent Number 6,628,629 ("'629 Patent"), entitled "Reservation based prioritization method for wireless transmission of latency and jitter sensitive IP-flows in a wireless point to multi-point transmission system." IV is the assignee and owner of the right, title, and interest in and to the '629 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

15. On April 15, 2008, the PTO issued United States Patent Number 7,359,971 ("'971 Patent"), entitled "Use of priority-based scheduling for the optimization of latency and jitter sensitive IP flows in a wireless point to multi-point transmission system." IV is the assignee and owner of the right, title, and interest in and to the '971 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

16. On August 12, 2008, the PTO issued United States Patent Number 7,412,517 ("'517 Patent"), entitled "Method for providing dynamic bandwidth allocation based on IP-flow characteristics in a wireless point to multi-point (PTMP) transmission system." IV is the assignee and owner of the right, title, and interest in and to the '517 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

17. On November 15, 2016, the PTO issued United States Patent Number RE46,206 ("'206 Patent"), entitled "Method and computer program product for internet protocol (IP)—flow classification in a wireless point to multi-point (PTMP) transmission system." IV is the assignee and owner of the right, title, and interest in and to the '206 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

FACTUAL BACKGROUND

Intellectual Ventures

18. Intellectual Ventures Management, LLC ("Intellectual Ventures") was founded in 2000. Since its founding, Intellectual Ventures has been deeply involved in the business of invention. Intellectual Ventures creates inventions and files patent applications for those

inventions; it collaborates with others to develop and patent inventions; and it acquires and licenses patents from individual inventors, universities, and other institutions. A significant aspect of Intellectual Ventures' business is managing the plaintiff Intellectual Ventures I LLC.

19. Intellectual Ventures' business includes purchasing important inventions from individual inventors and institutions, and then licensing the inventions to those who need them. Through this business, Intellectual Ventures enables inventors to reap a financial reward from their innovations, which is often a difficult task for individual inventors.

20. Intellectual Ventures also develops its own inventions. Intellectual Ventures has a staff of scientists and engineers who develop ideas in a broad range of fields, including agriculture, computer hardware, life sciences, medical devices, semiconductors, and software. Intellectual Ventures has invested millions of dollars developing such ideas and has filed hundreds of patent applications on its inventions every year, making it one of the top patent filers in the world. Intellectual Ventures also has invested in laboratory facilities to assist with the development and testing of new ideas.

The T-Mobile Network

21. The T-Mobile Defendants are in the business of providing wireless telephone services to customers throughout the United States, including the state of Texas, under the T-Mobile and MetroPCS brands. In conjunction with their partners, Ericsson and LM Ericsson, the T-Mobile Defendants have deployed a wireless network according to the LTE telecommunications standard.

22. As a result of the expansion of their LTE network, the T-Mobile Defendants have been enormously successful in increasing their customer base. By the end of the first quarter of

2017, the T-Mobile Defendants had approximately 73 million wireless customers nationwide, and their annual revenue for 2016 was nearly $27.8 billion.

23. Much of the equipment installed in the accused LTE network was acquired from the T-Mobile Defendants' longtime business partners, Ericsson and LM Ericsson, which design, manufacture, import and sell LTE telecommunications equipment, including LTE base stations, known as eNodeBs. In 2012, T-Mobile USA selected Ericsson as one of two companies to provide and deploy LTE cellular equipment. More recently, the T-Mobile and Ericsson Defendants partnered to deploy commercially available Ericsson LTE hardware and software capable of gigabit speeds, and they have announced their intention to cooperate on the installation of 600MHZ equipment.

24. The Ericsson and T-Mobile Defendants work closely together in the deployment, testing, and servicing of the T-Mobile Defendants' network. Ericsson touts that "Ericsson's strong design and solution capabilities enable the T-Mobile Defendants to deploy the most advanced LTE networks for its subscribers." (https://www.ericsson.com/en/press-releases/2017/1/2068787-t-mobile-and-ericsson-first-in-north-america-to-demonstrate-nearly-1-gbps-lte-over-the-air-on-commercially-available-network-equipment-and-software). Ericsson also advertises how "[w]ith Ericsson's support, T-Mobile provides nationwide [Enhanced Voice Service] support for VoLTE . . . calling users." (https://www.ericsson.com/en/news/2016/6/enhanced-hd-voice-for-volte-launched-by-t-mobile-and-ericsson).

25. The T-Mobile and Ericsson Defendants continue to closely collaborate in the deployment of the T-Mobile Defendants' LTE network, the operation of which infringes IV's asserted patents. For example, "Ericsson and T-Mobile are working together on a network

evolution plan and optimization path to . . . . maximize the success of LTE." (https://www.ericsson.com/en/press-releases/2017/2/2082064-ericsson-and-t-mobile-pioneering-superior-lte-network-capabilities-in-readiness-for-5g-deployments). The T-Mobile and Ericsson Defendants also announced that their collaboration will extend into the deployment of 5G. (https://newsroom.t-mobile.com/news-and-blogs/nationwide-5g.htm, quoting Borje Ekholm, President and CEO of Ericsson: "We will support T-Mobile US with 5G radio development for [the 600MHz spectrum].").

26. Upon information and belief, the T-Mobile Defendants are currently engaged in testing and rolling out upgrades to their LTE network, including Gigabit LTE and other services generally referred to as 4.5G, 4.9G and 5G, with all of their radio access network vendors. Testing is currently underway with respect to one or more of these advanced systems, which upon information and belief, incorporate infringing technology.

COUNT I

Direct Infringement of the '629 Patent by All Defendants

27. Paragraphs 1 through 26 are incorporated by reference as if fully restated herein.

28. As detailed below, each defendant has directly infringed and is infringing claims 1 and 4, and at least one of claims 2 and 3, of the '629 Patent under 35 U.S.C. § 271(a).

29. Defendants maintain, operate, and use mobile telecommunication systems and/or networks in conformance with 3rd Generation Partnership Project (3GPP) Long-Term Evolution (LTE) related standards. *See, e.g.*, https://www.ericsson.com/res/docs/2015/ericsson-3gpp-submission-study-whitepaper-may-2015.pdf, https://www.t-mobile.com/coverage/4g-lte-network. The T-Mobile Defendants own and operate an infringing network, and upon

information and belief, the Ericsson Defendants install, test, and service base stations and associated equipment within the network.

30. The 3GPP LTE standards describe the operation of a radio access network, such as the network operated by the T-Mobile Defendants, that provides wireless connectivity from a User Equipment ("UE," *e.g.*, a Smart Phone) to one or more Internet Protocol ("IP") networks (*e.g.*, the Internet). *See* 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (Release 8), 3GPP TS 23.401, V8.8.0 (2009-12) and all other versions thereof ("TS 23.401") § 1; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 8), 3GPP TS 36.300, V8.9.0 (2009-06) and all other versions thereof ("TS 36.300") § 4. Within the radio access network, the eNodeB is responsible for wireless radio transmission and reception in one or more cells to/from the UE. *See* TS 36.300 §§ 3.2, 4.1. The eNodeB's basic transmission scheme divides a frequency channel's bandwidth into subcarriers and divides time into slots. *See* TS 36.300 § 5.

31. The eNodeB includes downlink and uplink resource schedulers that allocate physical layer resources for transmitting data packets in downlink and uplink directions respectively. *See* TS 36.300, V.8.9.0 § 11.1. The downlink and uplink schedulers operate in accordance with reservation algorithms to specify radio resource allocations for one more slots in one or more future transmission frames. *See* 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Radio Access (E-UTRA) Medium Access Control (MAC) protocol specification (Release 8), 3GPP TS 36.321 V8.0.0

(2007-12), and all other versions thereof ("TS 36.321") § 5.10. On information and belief, the downlink and uplink schedulers both include a semi-persistent scheduling feature that reserves multiple slots in multiple future transmission frames. *See* TS 36.321 § 5.10; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Radio Access (E-UTRA) Radio Resource Control (RRC) Protocol specification (Release 8); 3GPP TS 36.331 V8.5.0 (2009-03) , and all other versions thereof ("TS 36.331") § 6.3.2. The data packets are placed in an isochronous manner based on the configured interval between data packets. *See* TS 36.331 § 6.2.

32. According to Ericsson product literature, Ericsson provides eNodeBs and associated software for implementing semi-persistent scheduling, and the default setting for the feature is enabled. *See, e.g.*, https://www.scribd.com/document/349590143/Volte-Ran-Featurs-Session-2. Upon information and belief, the T-Mobile/Ericsson eNodeBs implement semi-persistent scheduling.

33. Upon information and belief, the T-Mobile and Ericsson Defendants have performed the methods claimed and thereby infringed claims 1 and 4 of the '629 Patent and at least one of claims 2 and 3 of the '629 Patent during the course of the installation, testing, and/or ordinary operation of the T-Mobile Network. Using semi-persistent scheduling, multiple slots in multiple future frames are reserved in a manner that facilitates isochronous placement of packets (claim 1). Depending on the subframe interval that is configured, there may be a periodic variation between placement of packets (claim 2) or no periodic variation between placement of packets (claim 3). In addition, the eNodeB determines whether the IP flow is jitter-sensitive (claim 4).

34. Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the ’629 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the ’629 Patent and that the ’629 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the ’629 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the ’629 Patent.

COUNT II

Indirect Infringement of the ’629 Patent by the Ericsson Defendants

35. Paragraphs 1 through 34 are incorporated by reference as if fully restated herein.

36. On information and belief, Ericsson and LM Ericsson have induced infringement by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b) and committed contributory infringement pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the methods claimed in the ’629 Patent, along with instructions that induce the T-Mobile Defendants to perform the claimed methods.

37. On information and belief, Ericsson and LM Ericsson take active steps to induce infringement of one or more of claims 1-4 of the ’629 Patent by the T-Mobile Defendants, knowing that those steps will induce, encourage and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring Ericsson software so as to provide semi-persistent scheduling, providing

instructions on the use of the semi-persistent scheduling feature, and participating in the construction, operation, and maintenance of the T-Mobile Defendants' infringing network specifically for the purpose of performing the infringing methods.

38. On information and belief, Ericsson and LM Ericsson know or should know that such activities induce the T-Mobile Defendants to infringe one or more of claims 1-4 of the '629 Patent by performing the claimed methods.

39. On information and belief, Ericsson and LM Ericsson contribute to the infringement of one or more of claims 1-4 of the '629 Patent by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by Ericsson and LM Ericsson that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules which are capable of carrying out semi-persistent scheduling traffic transmission. The semi-persistent scheduling software module is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least one of claims 1-4 of the '629 Patent by performing the claimed methods.

40. By way of at least this Complaint, Ericsson and LM Ericsson know of the '629 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of one or more of at least claims 1-4 of the '629 Patent by the T-Mobile Defendants.

41. Ericsson and LM Ericsson undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the '629 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, Ericsson and LM Ericsson have been aware of an objectively high likelihood that their actions

constituted and continue to constitute infringement of the ’629 Patent and that the ’629 Patent is valid. On information and belief, Ericsson and LM Ericsson could not reasonably, subjectively believe that their actions do not constitute infringement of the ’629 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Ericsson and LM Ericsson have continued their infringing activities. As such, Ericsson and LM Ericsson have and or/will continue to willfully infringe the ’629 Patent.

COUNT III

Direct Infringement of the ’971 Patent by the All Defendants

42. Paragraphs 1 through 41 are incorporated by reference as if fully restated herein.

43. As detailed below, each defendant has directly infringed and is infringing one or more of claims 12-39 of the ’971 Patent under 35 U.S.C. § 271(a).

44. The LTE systems operated by the T-Mobile Defendants comprise telecommunications equipment, including eNodeBs, that communicate wirelessly with UE. Each of the eNodeBs also communicate with other equipment in the T-Mobile Defendants’ network including an evolved packet core (EPC) comprising at least a serving gateway (S-GW), a packet data network gateway (P-GW), a mobility management entity (MME), and equipment performing a policy and charging rules function (PCRF). The T-Mobile Defendants are in the business of selling and offering for sale UE and wireless telecommunications services to customers throughout the United States, including the state of Texas. The T-Mobile Defendants own or operate all equipment in the infringing networks or alternatively exercise direction and control over the operation of all equipment in the infringing networks in order to provide the benefit of telecommunications services to their customers. The T-Mobile and Ericsson Defendants employ staff (*e.g.*, network administrators and engineers) to operate work stations in

order to interface with, install, configure, manage, monitor, test, and control the eNodeBs and other equipment in the infringing networks including EPC, S-GW, P-GW, MME, PCRF equipment, and UE. On information and belief, various workstations are coupled to the eNodeBs and other equipment directly and/or indirectly via one or more data networks that allow local access and/or remote access.

45. Within the LTE radio access network operated by the Defendants, the eNodeB is responsible for wireless radio transmission and reception in one or more cells to/from the UE. *See* TS 36.300 §§ 3.2, 4.1. The eNodeB's basic transmission scheme divides a frequency channel's bandwidth into subcarriers, and divides time into slots. *See* TS 36.300 § 5.

46. The eNodeB includes downlink and uplink resource schedulers that allocate physical layer resources for transmitting data packets in downlink and uplink directions respectively. *See* TS 36.300, V.8.9.0 § 11.1. The downlink and uplink schedulers operate in accordance with reservation algorithms to specify radio resource allocations for one or more slots in one or more future transmission frames. TS 36.321, § 5.10. On information and belief, the downlink and uplink schedulers both include a semi-persistent scheduling feature that reserves multiple slots in multiple future transmission frames. *See* TS 36.321 § 5.10; TS 36.331. § 6.3.2. The data packets are placed in an isochronous manner based on the configured interval between data packets. *See* TS 36.331 § 6.2.

47. Independent claim 12 of the '971 Patent and its dependent claims describe a quality of service (QOS) aware, wireless communications system including a wireless access point base station having a scheduler, one or more host workstations, and one or more wireless network stations. The T-Mobile Defendants employ such a system in their LTE network, which includes host workstations used to interface with, install, configure, test, manage, monitor and

control the eNodeBs and other equipment in the infringing networks including EPC, S-GW, P-GW, MME, PCRF equipment, and UE. The T-Mobile Defendants' eNodeBs are wireless access point base stations having uplink and downlink schedulers and hardware and software modules that provide means for assigning future slots in accordance with the requirements of claim 12. The precise scope of the T-Mobile Defendants' infringement will be determined during discovery.

48. The T-Mobile Defendants' use of the infringing networks, the making and configuration of the systems, and the sale of services generated through the use of the systems constitutes direct infringement of one or more of claims 12-39 of the '971 Patent. On information and belief, the Ericsson Defendants installed, tested, configured, and serviced equipment in the infringing T-Mobile Network, including Ericsson eNodeBs, thereby making and using the systems disclosed in claims 1 and 4 of the '971 Patent and infringing those claims under 35 U.S.C. § 271(a).

49. The T-Mobile and Ericsson Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the '971 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the '971 Patent and that the '971 Patent is valid. On information and belief, all Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the '971 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, all Defendants have continued their infringing activities. As such, all Defendants have willfully infringed and/or will continue to willfully infringe the '971 Patent.

COUNT IV

Indirect Infringement of the ’971 Patent by the Ericsson Defendants

50. Paragraphs 1 through 49 are incorporated by reference as if fully restated herein.

51. On information and belief, Ericsson and LM Ericsson have induced infringement by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b) and committed contributory infringement pursuant to 35 U.S.C. § 271(c), by providing the eNodeB hardware and software necessary for the T-Mobile Defendants to make and use infringing systems.

52. On information and belief, Ericsson and LM Ericsson take active steps to induce infringement of one or more of at least claims 12-39 of the ’971 Patent by the T-Mobile Defendants, knowing that those steps will induce, encourage and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring Ericsson eNodeB software so as to provide semi-persistent scheduling during communications with compatible LTE UE, providing instructions on the use of the semi-persistent scheduling feature and participating in the construction and maintenance of the T-Mobile Defendants’ infringing network including installation, configuration and management of Ericsson eNodeBs that operate in conjunction with other equipment in the T-Mobile Defendants’ infringing network including EPC, S-GW, P-GW, MME, and PCRF equipment. On information and belief, Ericsson and LM Ericsson know or should know that such activities induce the T-Mobile Defendants to infringe one or more of at least claims 12-39 of the ’971 Patent.

53. On information and belief, Ericsson and LM Ericsson contribute to the infringement of one or more of claims 12-39 of the ’971 Patent by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by Ericsson and LM Ericsson that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software

modules which are capable of carrying out semi-persistent scheduling of wireless communication resources. The semi-persistent scheduling software module is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, Ericsson and LM Ericsson know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 12-39 of the '971 Patent.

54. By way of at least this Complaint, Ericsson and LM Ericsson know of the '971 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of one or more of at least claims 12-39 of the '971 Patent by the T-Mobile Defendants.

55. Ericsson and LM Ericsson undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the '971 Patent which has been duly issued by the PTO, and is presumed valid. For example, since at least the filing of this action, Ericsson and LM Ericsson have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the '971 Patent and that the '971 Patent is valid. On information and belief, Ericsson and LM Ericsson could not reasonably, subjectively believe that their actions do not constitute infringement of the '971 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Ericsson and LM Ericsson have continued their infringing activities. As such, Ericsson and LM Ericsson have willfully infringed and/or will continue to willfully infringe the '971 Patent.

COUNT V

Direct Infringement of the '517 Patent by All Defendants

56. Paragraphs 1 through 55 are incorporated by reference as if fully restated herein.

57. As detailed below, each defendant has directly infringed and is infringing at least claims 1 and 4 of the ’517 Patent, under 35 U.S.C. § 271(a).

58. The T-Mobile Defendants own and operate the infringing LTE networks, and upon information and belief, the Ericsson Defendants install, test, and service the equipment in the infringing networks including the eNodeBs.

59. The 3GPP LTE standards describe a radio access network, such as the network operated by the T-Mobile Defendants, that provides wireless connectivity from UE to one or more IP networks (*e.g.*, the Internet). *See* TS 23.401 § 1, TS 36.300 § 4. Within the radio access network, the eNodeB is responsible for wireless radio transmission and reception in one or more cells to/from the UE. *See* 3rd Generation Partnership Project; Technical Specification Group Technical Specification Group Core Network and Terminals; General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTP v1-U) (Release 8); 3GPP TS 29.281 V8.5.0 (2010-03), and all other versions thereof (“TS 29.281”) § 5. The eNodeB’s basic transmission scheme divides a frequency channel’s bandwidth into subcarriers and divides time into slots. *See* TS 36.300 § 5.

60. The eNodeB includes downlink and uplink resource schedulers that allocate physical layer resources for transmitting data packets in downlink and uplink directions respectively. *See* TS 36.300, § 11.1; *see also* TS 36.321 § 5.10. The eNodeB analyzes contents of packets, including header information in those packets, and uses its downlink scheduler to schedule packets in the downlink direction and allocate bandwidth in the downlink direction. *See, e.g.,* 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Policy and charging control architecture (Release 10); 3GPP TS 23.203 V10.6.0 (2012-03), and all other versions thereof, § 6.2; TS 29.281 §§ 4, 5; TS 23.401 § 5.1. The

eNodeB further receives reservation requests from a UE requesting to send data in the uplink direction. One such reservation request is a Random Access Msg. 3. TS 36.300 § 10.1.5. The Random Access Msg. 3 contains both a subscriber identifier and subscriber attributes including a buffer status report. *Id.* The T-Mobile/Ericsson eNodeB uses its uplink resource scheduler to allocate bandwidth based on the Random Access Msg., and the eNodeB sends a DCI Format 0 message to the UE indicating assigned slots in specified frames of the allocated bandwidth. *Id;* TS 36.300 §§ 5, 11. The DCI Format 0 message is sent via a physical downlink control channel (PDCCH) comprising a reservation request acknowledgment section of a frame. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and Channel Coding (Release 11), 3GPP TS 36.212 V11.4.0 (2013-12), and all other versions thereof, § 5.3.3.1.1.

61. Upon information and belief, the T-Mobile and Ericsson Defendants have performed the methods claimed and thereby infringed claims 1 and 4 of the ‘517 Patent during the course of the installation, testing, and/or ordinary operation of the T-Mobile Network.

62. Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the ’517 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the ’517 Patent and that the ’517 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the ’517 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued

their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the ’517 Patent.

COUNT VI

Indirect Infringement of the ’517 Patent by the Ericsson Defendants

63. Paragraphs 1 through 62 are incorporated by reference as if fully restated herein.

64. On information and belief, Ericsson and LM Ericsson have induced infringement by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b) and committed contributory infringement pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the methods claimed in the ’517 Patent, along with instructions, installation, and maintenance services.

65. On information and belief, Ericsson and LM Ericsson take active steps to induce infringement of at least claims 1 and 4 of the ’517 Patent by the T-Mobile Defendants, knowing that those steps will induce, encourage and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, (a) configuring their software to analyze the contents of packets sent from an eNodeB to a UE for scheduling downlink packet transmission and further configuring their software to respond to random access Msg. 3 reservation requests by allocating bandwidth for transmission in the uplink direction from the UE to the eNodeB, (b) providing instructions on the use of the eNodeB scheduling features, and (c) participating in the construction and maintenance of the T-Mobile Defendants’ infringing network. On information and belief, Ericsson and LM Ericsson know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 1 and 4 of the ’517 Patent by performing the claimed methods.

66. On information and belief, Ericsson and LM Ericsson contribute to the infringement of at least claims 1 and 4 of the ’517 Patent by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by Ericsson and LM Ericsson that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules which are capable of performing the accused scheduling features outlined in Count V. The scheduling software is especially adapted for use in the infringing systems and has no non-infringing uses. On information and belief, Ericsson and LM Ericsson know or should know that such activities contribute to the T-Mobile Defendants’ infringement of at least claims 1 and 4 of the ’517 Patent by performing the claimed methods.

67. By way of at least this Complaint, Ericsson and LM Ericsson know of the ’517 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of one or more of at least claims 1 and 4 of the ’517 Patent by the T-Mobile Defendants.

68. Ericsson and LM Ericsson undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the ’517 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, Ericsson and LM Ericsson have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the ’517 Patent and that the ’517 Patent is valid. On information and belief, Ericsson and LM Ericsson could not reasonably, subjectively believe that their actions do not constitute infringement of the ’517 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Ericsson and LM Ericsson have continued their infringing activities. As such,

Ericsson and LM Ericsson have willfully infringed and/or will continue to willfully infringe the '517 Patent.

COUNT VII

Direct Infringement of the '206 Patent by All Defendants

69. Paragraphs 1 through 68 are incorporated by reference as if fully restated herein.

70. As detailed below, each defendant has directly infringed and is infringing at least claims 1, 109, and one or more additional claims of the '206 Patent under 35 U.S.C. § 271(a). Claims 1 and 109, and the claims depending therefrom, are drawn to methods for classifying and scheduling IP flows or packets in accordance with quality of service (QOS) requirements. The precise scope of infringement will be determined during discovery.

71. The T-Mobile Defendants own and operate the infringing LTE networks, and upon information and belief, the Ericsson Defendants install, configure, test, and maintain the eNodeBs and associated equipment in the T-Mobile Defendants' networks in a manner that results in performance of the infringing methods.

72. The 3GPP LTE standards describe a radio access network, such as the network operated by the T-Mobile Defendants that provides wireless connectivity from a UE to one or more IP networks. *See* TS 23.401, TS 36.300. Within the radio access network, the eNodeB is responsible for wireless radio transmission of IP data packets to/from the UE. *See* TS 36.300 §§ 3.2, 4.1. The eNodeB's basic transmission scheme divides a frequency channel's bandwidth into subcarriers, and divides time into slots. *See* TS 36.300 § 5.

73. The IP packet transmitted by the eNodeB to the UE includes an IP header and the IP payload. *See* Internet Engineering Task Force ("IETF") RFC 791 and IETF RFC 2460. The eNodeB analyzes an Internet Protocol (IP) flow in a packet-centric manner to determine the EPS

bearer identifier. *See* TS 23.401 § 4.7.3. The eNodeB further classifies the IP flow according to the QoS Class Identifier ("QCI") value of the EPS bearer. *See* TS 23.401 § 6.1.7, Table 6.1.7. The eNodeB includes resource schedulers that allocate physical layer resources for the downlink shared channel (DL-SCH). *See* TS 36.300 § 11.1. A bearer's QCI value and other information regarding the UE is used by the eNodeB scheduler when making resource allocation and scheduling decisions. *See* 3GPP TS 36.300 §§ 11.1 & 13.

74. The T-Mobile Defendants infringe at least claims 1 and 109 of the '206 Patent through the performance of the aforesaid methods and the sale of services generated through practice of the claimed methods. Upon information and belief, the Ericsson Defendants have performed the methods claimed in at least claims 1 and 109 when installing, testing, and maintaining eNodeBs in the T-Mobile Defendants' network, and such conduct constitutes direct infringement.

75. Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the '206 Patent, which has been duly re-issued by the PTO and is presumed valid. For example, since at least the filing of this action, Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the '206 Patent and that the '206 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the '206 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the '206 Patent.

COUNT VIII

Indirect Infringement of the ’206 Patent by the Ericsson Defendants

76. Paragraphs 1 through 75 are incorporated by reference as if fully restated herein.

77. On information and belief, Ericsson and LM Ericsson have induced infringement by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b) and committed contributory infringement pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the methods claimed in the ’206 Patent, along with instructions, installation, and maintenance services.

78. On information and belief, Ericsson and LM Ericsson take active steps to induce infringement of at least claims 1 and 108 of the ’206 Patent by the T-Mobile Defendants, knowing that those steps will induce, encourage and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring their software so as to perform the infringing methods of classifying and scheduling IP flows or packets in accordance with QOS requirements, providing instructions on the use of the infringing features, and participating in the construction and maintenance of the T-Mobile Defendants’ infringing network.

79. On information and belief, Ericsson and LM Ericsson know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 1 and 109 of the ’206 Patent by performing the claimed methods.

80. On information and belief, Ericsson and LM Ericsson contribute to the infringement of at least claims 1 and 109 of the ’206 Patent by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by Ericsson and LM Ericsson that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules which are capable of carrying out the infringing methods of classifying and scheduling

IP flows or packets in accordance with QOS requirements. The classifying and scheduling software modules are especially adapted for use in the infringing systems. On information and belief, Ericsson and LM Ericsson know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 1 and 109 of the '206 Patent by performing the claimed methods.

81. By way of at least this Complaint, Ericsson and LM Ericsson know of the '206 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of at least claims 1 and 109 of the '206 Patent by the T-Mobile Defendants.

82. Ericsson and LM Ericsson undertook and continue their infringing actions despite an objectively high likelihood that such activities infringed the '206 Patent, which has been duly re-issued by the PTO and is presumed valid. For example, since at least the filing of this action, Ericsson and LM Ericsson have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the '206 Patent and that the '206 Patent is valid. On information and belief, Ericsson and LM Ericsson could not reasonably, subjectively believe that their actions do not constitute infringement of the '206 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Ericsson and LM Ericsson have continued their infringing activities. As such, Ericsson and LM Ericsson have willfully infringed and/or will continue to willfully infringe the '206 Patent.

DEMAND FOR JURY TRIAL

83. IV hereby demands a trial by jury on all claims and issues so triable.

PRAYER FOR RELIEF

WHEREFORE, IV respectfully requests judgment for itself and against Defendants as follows:

a. that this Court adjudge that Defendants have infringed each of the ’629, ’971, ’517, and ’206 Patents;

b. that this Court adjudge that Defendants have willfully infringed each of the ’629, ’971, ’517, and ’206 Patents;

c. that this Court ascertain and award IV damages under 35 U.S.C. § 284 sufficient to compensate for Defendants’ infringement, including but not limited to infringement occurring before the filing of this lawsuit;

d. that this Court ascertain and award IV any post-judgment ongoing royalties under 35 U.S.C. § 284 as may be appropriate;

e. that this Court award any applicable pre-judgment and post-judgment interest;

f. that this Court find this case to be exceptional pursuant to 35 U.S.C. § 285 and award IV its attorneys’ fees, costs, and expenses in this action;

g. that this Court award IV such other relief at law or in equity as the Court deems just and proper.

DATED: August 9, 2017

Respectfully submitted,

/s/ Martin J. Black by permission Claire Henry
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